

the two latter. In his second paper Prof. Wyville Thomson drew attention to peculiarities in the mode of propagation of certain Echinoderms of the Southern Sea. He passed in review examples of the Sea-cucumbers (*Holothuroids*), Sea Urchins (the circular *Cidaroids*, and heart-shaped, *Spatangoids*), Star-fish (*Asteroids*), and the Brittle Stars (*Ophiuroids*). In allusion to their phases of development he stated the majority of these pass from the egg without the intervention of a locomotive pseudembryo. Among other data in support of this view he said, that while in warm and temperate seas "plutei" and "bipinnari" were constantly taken in the surface-net; yet during the southern cruise between the Cape of Good Hope and Australia, only one form of Echinoderm pseudembryo occurred, and which was considered with some little doubt as the larva of *Chirodota* from the presence of dermal, calcareous, wheel-shaped spicules. Furthermore Prof. Wyville Thomson described in detail the almost constant occurrence among the majority of the foregoing groups a curious, receptacular pouch wherein the young are carried until arriving at a certain maturity. This marsupium is situated on the dorsal portion of the body, is composed of a series of plates which meet centrally and permit of the young creeping about and returning to it for shelter. The young derive no nutriment from the parent while contained in the "nursery," other than it may be a mucous secretion.

THE U.S. WEATHER MAPS*

IN this fourth contribution to meteorology, Prof. Loomis discusses certain points of a miscellaneous nature which have been either very slightly or not at all examined in his three previous contributions. The movements of areas of high barometer, which are of so great importance in their relations to weather and climate, have been examined with the result that while the average track of areas of low pressure across the United States is nine degrees to the north of east, the track of areas of high barometer advance toward a point several degrees south of east, and with a velocity somewhat less than the former.

As regards the conditions under which the monthly minima of temperature occur, it is shown that these conditions, viz., winds very light, sky clear, and pressure above its mean height, are substantially the same at Jakutsk, Siberia, as at New Haven. Prof. Loomis is of opinion that it is true universally that periods of unusual cold are generally accompanied by a barometer above the mean, and by a descent of air from the upper regions of the atmosphere. These areas of high barometer have a broader significance than is here implied. It is the still, clear, and dry atmosphere accompanying them, and its relations to terrestrial and solar radiation, which afford the conditions of extreme temperatures. The monthly minima of the cold months of the year and the maxima of the warm months both frequently occur under the conditions afforded by areas of high pressure. On the other hand, in North-western Europe it is often observed that the minima of temperature during the warm months repeatedly occur within areas of low pressure where very light easterly and northerly winds prevail. In discussions of the relations of temperature and pressure, it is seldom kept steadily in mind that the given temperature is merely the temperature observed within a few feet of the earth's surface, which, as regards areas of high pressure, will nearly always mislead if it be used as a basis from which to estimate the temperature of the higher strata vertical to it; the surface temperature being abnormally low in winter from contact with the cooled surface, and in summer abnormally high from contact with the heated surface of the earth.

The examination of storm paths in America, the Atlantic, and Europe is important from the bearing of the subjects on climatology and weather-forecasting. Some interesting results of such an examination are given by Prof. Loomis in the average paths marked on the chart accompanying the paper. The results, however, are not calculated to be practically useful until the average paths be laid down for each month in the year, owing to the very great differences in these paths as regards different months. Thus, in North-western Europe, during the spring months, when east winds are most prevalent in Great Britain, many storm tracks, or the course of barometric depressions, are more southerly, and during the winter months more northerly than that indicated on the chart. If the track of storm-centres in

winter generally took the line of The Channel, our winters would, on the average, be much more severe than they are, owing to the greater frequency of easterly and northerly winds, which would necessarily follow. But open winters are the rule in these islands, and even as far north as Faroe, where, during winter, southerly and westerly winds largely preponderate, thus showing that the central tracks of the majority of our winter storms lie to the north of Faroe. The exact determination of the average monthly tracks and the more marked deviations from them would throw light on several important questions affecting the climatology of the whole of North-western Europe.

Since the average velocity of storms over the United States as deduced by Prof. Loomis from 485 cases, is twenty-six miles per hour, and over the Atlantic, as deduced from 134 cases, is 19.3 miles per hour; and the average velocity of European storms as deduced by Prof. Mohn is 26.7 miles per hour, it follows that storms travel less rapidly over the ocean than over continents. If further inquiry confirms this result, we have here a valuable contribution to the theory of storms which will likely lead to a clearer insight into the causes which regulate their rate of propagation over the earth's surface, accelerating it in some cases, and in others retarding it as is frequently seen off the coast of Newfoundland and in the Bay of Biscay.

NATURAL SCIENCE AT CAMBRIDGE

THE Cambridge Natural Science Tripos has just entered upon a new phase of existence. The recent examination is the first in which a division into two parts, elementary and advanced, is carried out, the former being held in June and the latter in December. Candidates who do not satisfy the examiners in the first part are not permitted to compete in the second. The final class-list is to be based on the alphabetical principle, but the first class will consist of two divisions, each arranged alphabetically, and the subject or subjects for which a man is placed in the first class are to be indicated, while a special mark will reward superior proficiency. This system removes some of the worst faults of the competitive system, and is of especial benefit to the more able men. One subject will not be pitted against another as regards marks, an accumulation of cramming in several subjects will not serve an inferior man, and clear testimony will be given that a man has a competent knowledge of a subject, or that he is specially proficient in it. With such arrangements, the value of the examination will largely depend upon the wisdom of individual examiners. It will be obvious that there should be at least two examiners in each subject instead of one. Also the pittance they receive should be transformed into fair remuneration, which will, no doubt, be done as soon as the University has more funds at its disposal.

It was to be expected that a new system, by which no man receives any credit in a subject unless he shows satisfactory knowledge of it, and by which the examination is limited to three days, would produce a large number of failures to attain honours. The number of candidates in June was forty-four, a large increase; of these only thirty-one obtained honours, while ten others received the ordinary degree. On scrutinizing the papers, it appears that there is a difficulty in equally adjusting the questions which probably have affected the result. Two questions in each subject, except human anatomy, are given in every paper; one question only is set in human anatomy, which is introduced for the first time. I will quote some of the questions in geology and in physiology, giving fair samples; and it will be plain that they are not equivalent in difficulty, and that students of moderate ability and reading might gain honours by answering the former much more easily than the latter.

"In which of the three great divisions of stratified rocks do fossils of the genera *Ichthyosaurus*, *Phacops*, *Calamites*, *Voluta*, *Terebratula*, *Ostrea*, and *Micraster* respectively occur?" "Volcanic rocks have been divided into two classes, acidic and basic. Give the name and mineralogical composition of a common rock of each

* Results derived from an examination of the United States Weather Maps and other sources. By Prof. Elias Loomis, Yale College. Fourth Paper. From the *American Journal of Science and Arts*, vol. xi., Jan. 1876.

class." "To what conditions of deposit do fossils of the following groups of genera respectively point?—1. *Unio*, *Paludina*, and *Cyrena*. 2. *Nautilus* and *Globigerina*. Illustrate this by reference, in each case, to a British example."

"Explain what is meant by 'arterial tonus.' State generally what is the origin, course, distribution, and mode of termination of the nervous channels by which the brain and spinal cord influence arterial tonus." "Describe the rhythmical respiratory movements of the glottis in mammalian animals, referring to the mode of action of the most important muscles which are concerned in their production."

I only wish to point out the contrast in difficulty between the above sets of questions, without offering any opinion as to the suitability of either. In zoology and comparative anatomy the following question seems rather unusual for such an examination.—"Briefly describe the internal economy of a beehive, and the mutual relationships of its inmates." Here is a question in geographical distribution:—"In what countries are the following animals found—the orang-utan, vampire-bat, tapir, leopard, elk, emu, and python? State what principles of zoogeography are deducible from their distribution." It seems to me that a knowledge of the distribution of all the more important species is far beyond the pass qualification for an honours' examination. In admitting men to such a qualification, tests should rather be applied which every student of a subject ought to be able to respond to; but it is questionable whether we can yet expect every student of zoology and comparative anatomy to "state concisely the doctrine of evolution as employed in biology."

It is not stated in how many subjects a candidate must pass in order to obtain honours; nor are any named as essential. There is a strong feeling that elementary chemistry and physics should be made compulsory on all, and that students should be allowed to present themselves in these subjects at an earlier period of their course.

G. T. BETTANY

NOTES

WE are glad to learn that upwards of 1,000*l.* has been subscribed towards the Chemical Society Research Fund, so that the Council are now in a position to accept Dr. Longstaff's generous offer of 1,000*l.* to form a permanent fund. We only hope that the fund may still be largely increased.

THE Albert Medal of the Society of Arts for "distinguished merit in promoting Arts, Manufactures, and Commerce," has this year been unanimously awarded to Sir George B. Airy, K.C.B., the Astronomer Royal, for "Eminent Services rendered to Commerce by his Researches in Nautical Astronomy, and in Magnetism, and by his Improvements in the Application of the Mariner's Compass to the Navigation of Iron Ships." A prize of a Gold Medal was awarded to Mr. Hearson for the best "Revolution Indicator," which should accurately inform the officer on deck, and the engineer in charge of the engine, what are the number of revolutions of the paddles or screw per minute without the necessity of counting them. For papers read before the Society medals have been awarded as follows:—To Mr. Clements R. Markham, C.B., for his paper "On the Cultivation of Caoutchouc-yielding Trees," Mr. W. T. Thornton for his paper "On Irrigation Works in India," Mr. E. Hutchinson for his paper "On the Development of Central Africa," Mr. W. Valentin for his paper "On Dextrine-Maltose, and its use in Brewing."

MR. H. N. MOSELEY, M.A., has been elected to an Extraordinary Fellowship at Exeter College, Oxford, tenable for five years under a special ordinance sanctioned by the Visitor. Mr. Moseley, who was educated at Exeter College, proceeded to his B.A. degree in 1868, having obtained a "first class" in natural

science in Trinity term of the same year. He was elected in 1869 Radcliffe Travelling Fellow, and has recently been one of the scientific staff of the expedition of H.M.S. *Challenger*.

M. WADDINGTON intends to establish Fellowships in the several French Academies in imitation of the Fellowships of the English Universities. The French Fellowships are to hold good only for a limited period, and will not be subject to the restriction of celibacy. The credits will soon be asked for from the French Assemblies.

IN the University of London D.Sc. Examination Mr. Thomas Carnelley and Mr. Frank Clowes have passed in Inorganic Chemistry, Mr. James Gordon MacGregor in Electricity (treated experimentally), Mr. Edward Bibbins Aveling in Vegetable Physiology, and Prasanna Kumár Ráy in Logic and Moral Philosophy.

ON Thursday last the master and other members of the London Clothworkers' Company visited Leeds, in order to inspect the working of the Textile Industries' department of the Yorkshire College of Science, which was founded and endowed by the munificence of the Company. The visitors expressed their satisfaction with the results of the endowment, and the master, Mr. Wyld, in replying to the toast of the Company, showed that he had an unusually high idea of the duties which devolved on the London Companies as trustees of the large funds which belonged to them. While placing a high value on technical education, moreover, he expressed the opinion that any special education divorced from, or not based on, wide general culture, would be defective and inefficient.

MR. LLOYD, the president of the trustees of the Fisk donation for the construction and fitting up of the San Francisco Observatory, arrived in Paris at the end of June. His first visit was to M. Leverrier, who gave him every assistance in his power to enable him to fulfil the object of his mission. Mr. Lloyd is at liberty to use the observatory grounds for any experiments in connection with his large refractor, which it is intended to construct. M. Leverrier concurred with him in not attempting to construct a lens of more than one metre in diameter. The money at the disposal of Mr. Lloyd is 200,000*l.* The law-suit is at an end, and the donation of a similar sum for the museum is cancelled, but the astronomical donation has been confirmed.

PROF. H. G. SEELEY has been appointed Professor of Geography at the Queen's College for Ladies, Harley Street.

THE Geologists' Association are to make an excursion to the North Wales Border on Monday, July 17, and five following days.

THE forty-second annual meeting of the Statistical Society was held on June 27, at the Society's Rooms, the President, Mr. James Heywood, F.R.S., in the chair. The report read showed that the Society continues to advance steadily in numbers and in public estimation.

WE have before us the commencing number of "The Proceedings of the Linnean Society of New South Wales," which contains papers by Mr. Brazier, C.M.Z.S., on a new species of Australian and Solomon Island shells; by Mr. Ramsay on a new species of *Ptilotis* from the Endeavour River, with some remarks on the natural history of the East Coast Range near Rockingham Bay, and by Mr. Maclean, the President of the Society, on a new species of *Dandrophis* from Cleveland Bay. We are convinced that a work so well commenced has the good wishes of all interested in the diffusion of science.

MR. ALEXANDER AGASSIZ, in his recent trip to Peru, found occasion to conclude that the Pacific, within a comparatively recent time, extended through gaps in the Coast Range, and made an internal sea which stood at a height of not less than 2,900 feet, and probably much above this. This is proved by the fact of the occurrence of coral limestone 2,900 or 3,000 feet